



# Impact of the *Ready<sup>®</sup> Mathematics* Blended Core Curriculum

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# Research Overview

The Human Resources Research Organization (HumRRO), a nationally recognized third-party evaluator, conducted an evaluation to examine the impact of the *Ready Mathematics* Blended Core Curriculum on mathematics achievement for students in Grades K–5. This study was designed to meet the required rigor of the What Works Clearinghouse (WWC) 4.0 standards for quasi-experimental studies (WWC, 2017a) and the guidelines for a Level 2 (Moderate) rating for the Every Student Succeeds Act (ESSA) guidance for evidence-based research (US Department of Education, 2016). This was achieved by using a quasi-experimental design in which baseline equivalence was established between the *Ready Mathematics* Blended Core Curriculum and comparison groups. For the analysis, an outcome measure acceptable to WWC was used, and baseline achievement was included as a covariate. Additionally, a sampling design that mitigated the effects of any confounding factors was employed. HumRRO's findings provide evidence that school-level participation in the *Ready Mathematics* Blended Core Curriculum resulted in higher student-level achievement in mathematics, as measured by the *i-Ready Diagnostic*, compared to a comparison group composed of similar students.

This report was originally published in March 2019.

# Program Overview

The *Ready Mathematics* Blended Core Curriculum helps teachers create a rich classroom environment in which students at all levels become active, real-world problem solvers. Through teacher-led instruction, students develop mathematical reasoning, engage in discourse, and build strong mathematical habits. The program's instructional framework supports educators as they strengthen their teaching practices and facilitates meaningful discourse that encourages all learners. At the time of this study, the *Ready Mathematics* Blended Core Curriculum consisted of two *i-Ready Learning* components (i.e., *Ready Mathematics* curriculum and *i-Ready Personalized Instruction*) and one *i-Ready Assessment* component (i.e., *i-Ready Diagnostic*). The *Ready Mathematics* Blended Core Curriculum was designed to:

- Encourage students to develop a deeper understanding of mathematics concepts through the embedded Standards for Mathematical Practice
- Build on students' prior knowledge with lessons that make connections within and across grade levels and directly address the major focus of the grade
- Promote discourse and help all students access rigorous mathematics through the use of routines, teacher moves, and conversation tips
- Prepare students for the challenges of the state assessment with tasks and activities that develop students' conceptual understanding, build procedural fluency, and apply mathematics to novel situations

*i-Ready Classroom Mathematics* is the next evolution of the *Ready Mathematics* Blended Core Curriculum, with enhancements designed to maximize student success.

# Research Questions

The primary purpose of this evaluation was to estimate the impact of using the *Ready Mathematics Blended Core Curriculum* on student achievement. Particularly, HumRRO was interested in how the use of the three primary components that make up the *Ready Mathematics Blended Core Curriculum* (i.e., *Ready Mathematics* curriculum, *i-Ready Personalized Instruction*, and *i-Ready Diagnostic*) impact student achievement in mathematics beyond the use of the *i-Ready Diagnostic* assessment for mathematics only. As such, the research was focused on one primary research question, addressed separately for each grade in Grades K–5:

**What is the impact of the *Ready Mathematics Blended Core Curriculum* on student achievement in mathematics compared to a comparison group consisting of students who only took the *i-Ready Diagnostic* assessment?**

## Research Sample Description

For a school to have implemented the *Ready Mathematics Blended Core Curriculum* with adequate fidelity, it needed to meet the following eligibility criteria:

- Have adopted the *Ready Mathematics Blended Core Curriculum* as the school's primary core mathematics curriculum. This was determined through structured interviews with Curriculum Associates staff who had worked closely with the *Ready Mathematics* districts and schools. HumRRO eliminated those schools and districts that had not yet established *Ready Mathematics* as their primary curriculum.
- Show strong use of *i-Ready Personalized Instruction*, with most *i-Ready* student users engaging with *i-Ready Personalized Instruction* for an average of at least 30 minutes per week for a minimum of 18 weeks between the fall and spring *i-Ready Diagnostic* administrations. Information on this eligibility criterion was obtained through review of *i-Ready* data.
- Administer the *i-Ready Diagnostic* for Mathematics a minimum of two times during the school year—fall and spring—to the majority of the students in each school. This study was focused on whole class implementations. Schools using the program with select populations of students, such as those in need of interventions, were eliminated from the study. Information on this eligibility criterion was obtained through review of *i-Ready* data. The administration of the *i-Ready Diagnostic* was important as it was used as the outcome variable for this study.

# Study Design

Once schools meeting the eligibility criteria for the *Ready Mathematics* Blended Core Curriculum and comparison group were identified, matching was conducted to select comparable groups of schools and students. First, matching was conducted at the school level to ensure key school demographic characteristics were similar between the groups of *i-Ready* schools and comparison group schools. Schools were matched on the following variables:

- Percentage of students eligible for free or reduced-price lunch (FRL)
- Percentage of students with limited English proficiency (LEP)
- Percentage of students with disabilities (SWD)
- Percentage of students who identify as White and students of color

These variables were selected as they are known to be related to student achievement, and reliable data are available for public schools across the country, including all schools meeting the criteria for our sample. Baseline equivalency was successfully established for all grades. A total of 32 schools with more than 9,000 students from three states made up the *Ready Mathematics* Blended Core Curriculum group. These students were compared with 12,000 comparable students from across the country in the comparison group.

Following school-level matching, HumRRO compared the baseline student-level mathematics achievement, using fall *i-Ready Diagnostic* scores, separately at each grade level for all students in the sampled *Ready Mathematics* Blended Core Curriculum and comparison group schools. For Grades 1–5, baseline equivalence was accomplished at the student level on the fall 2017 mathematics achievement measure using all students in the schools. Student-level matching was required at Grade K to create samples of students with baseline mathematics achievement within the WWC established threshold. For Grade K, student-level matching was conducted using propensity score matching similar to what was used for the school matching. HumRRO used the fall 2017 *i-Ready Diagnostic* for Mathematics score as the matching variable. For Grade K, HumRRO matched one comparison student to each treatment student.

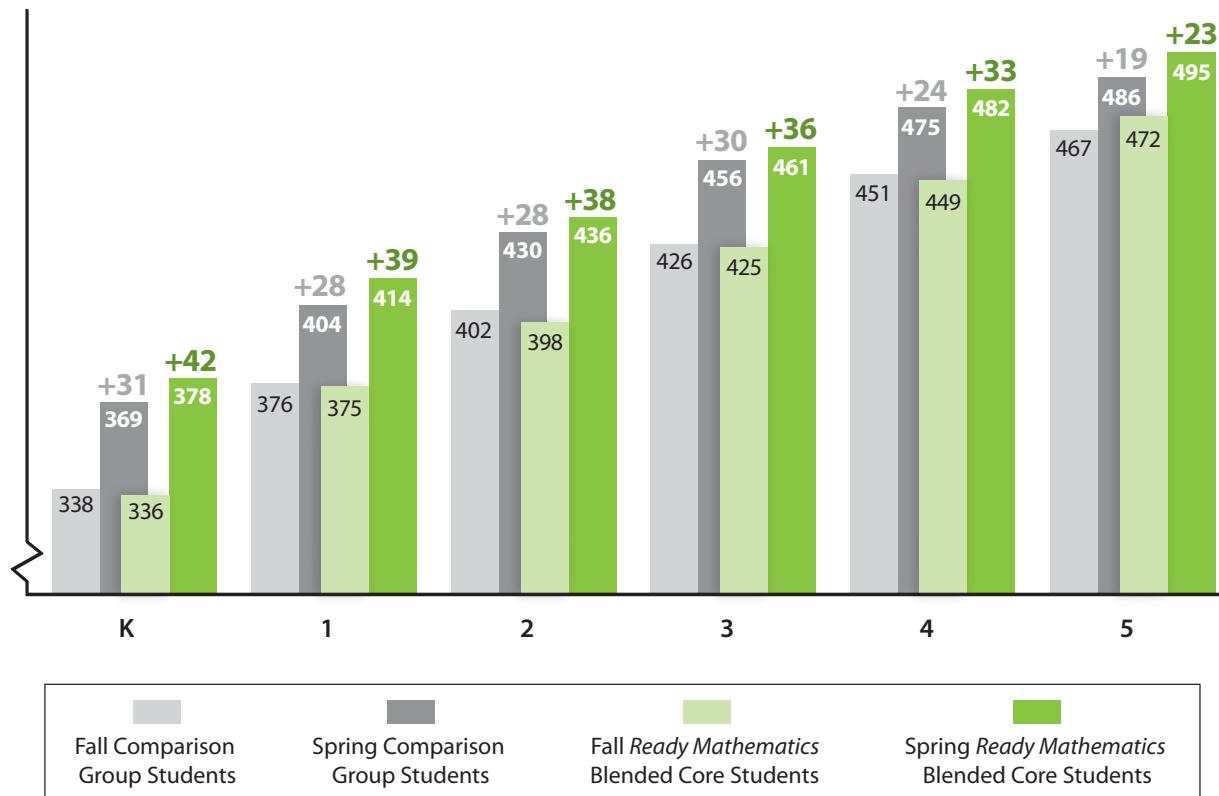
Following the selection of baseline equivalent groups, hierarchical linear modeling (HLM) was used to estimate the impact of the *Ready Mathematics* Blended Core Curriculum on student mathematics achievement. A two-level model was used to account for the clustered nature of the data with students nested within schools. Because effect size differences between the *Ready Mathematics* Blended Core Curriculum and comparison group on student achievement at baseline fell between .05 and .25 standard deviations, baseline mathematics achievement was included in the model as a covariate. To indicate the size of impacts, effect sizes were computed for all comparison groups using Hedge's *g* with an adjustment for small sample sizes (WWC, 2017b). Hedge's *g* is nearly identical to Cohen's *d* and has the same interpretation, but it is more appropriate for analyses with fewer students or schools.

In this paper, we will use the term “students of color” to refer to the racial and ethnic categories of Black or African American, Latino, and Asian, and we will use the term “English Learner” to refer to students who are not yet proficient in English, whether they are newcomers, long-term English Learners, multilingual learners, or otherwise. We recognize that language changes with time and that each demographic group described is not monolithic, nor is each individual within any designated demographic group in agreement on preferred language. As a company, we will continue to review, reflect on, and evolve the terminology with the goal of using bias-free, inclusive, and sensitive language labels.

# Results

The *Ready Mathematics* Blended Core Curriculum schools were found to perform significantly better than the comparison group schools on mathematics achievement as measured by students' *i-Ready Diagnostic* for all Grades K–5 (see Graph 1 and Table 1). The *p*-values for the analysis were well below the .05 WWC threshold. The effect sizes, as measured by Hedge's *g*, ranged from .17 (Grade 3) to .36 (Grades K and 1). The average scale score difference between fall and spring for the comparison group was 27 points, whereas the average difference for the *Ready Mathematics* Blended Core Curriculum group was 35 points. Looking solely at differences on the spring assessments and recognizing that baseline pretest scores for the *Ready Mathematics* Blended Core Curriculum and comparison groups are proximately equivalent, the results provide evidence that students using the *Ready Mathematics* Blended Core Curriculum in Grades K–5 grew, on average, approximately 5–10 scale score points more than students using other programs.

**Graph 1. *i-Ready Diagnostic* (Math) Scale Score Differences**



**Table 1. Impact Analysis Results for *Ready Mathematics* Blended Core Schools Compared to *i-Ready Diagnostic*-Only (Comparison) Schools for Mathematics Student Achievement in Grades K–5**

Grade	Group	ICC	Schools	Students	<i>i-Ready</i> Mean	<i>i-Ready</i> SD	Adj. Mean Diff. (SE)	p-value	Effect Size
K	Comparison	.30	21	889	368.89	23.79	9.25 (3.72)	.013	.36
	Treatment		18	889	378.13	27.67			
1	Comparison	.17	38	1,978	404.38	25.94	9.33 (1.62)	<.001	.36
	Treatment		25	1,470	413.71	25.99			
2	Comparison	.18	44	2,347	429.58	27.36	6.88 (1.43)	<.001	.25
	Treatment		24	1,588	436.46	27.01			
3	Comparison	.21	47	2,221	455.92	28.92	5.06 (1.81)	.005	.17
	Treatment		24	1,751	460.98	30.25			
4	Comparison	.23	51	2,628	475.42	30.39	6.33 (1.37)	<.001	.21
	Treatment		26	1,782	481.75	31.57			
5	Comparison	.29	42	2,167	485.96	33.59	8.72 (1.54)	<.001	.26
	Treatment		25	1,796	494.67	33.74			

# What Is Effect Size?

## How to Interpret Effect Sizes

An effect size is a quantitative measure of the magnitude of an experimental effect. In education research, effect size usually refers to the magnitude of the “treatment” or “intervention” program or practice on student or teacher outcomes.

Effect sizes are reported in standard deviation units as opposed to the original unit of measurement to allow for comparisons across studies or outcome measures. They are often categorized into “small,” “medium,” and “large” effects in which the larger the effect size, the stronger the impact of the treatment or intervention on the outcome of interest. Research shows that effect sizes in experimental studies of typical education interventions range from .03 to .17 and suggests that an effect size less than .05 can be considered small, .05 to .20 can be considered medium, and greater than .20 can be considered large (Kraft, 2019). Based on this interpretation, the effect size for *i-Ready* in this particular study ranges from medium to large, depending on the grade level and subject.

## Translating Effect Sizes

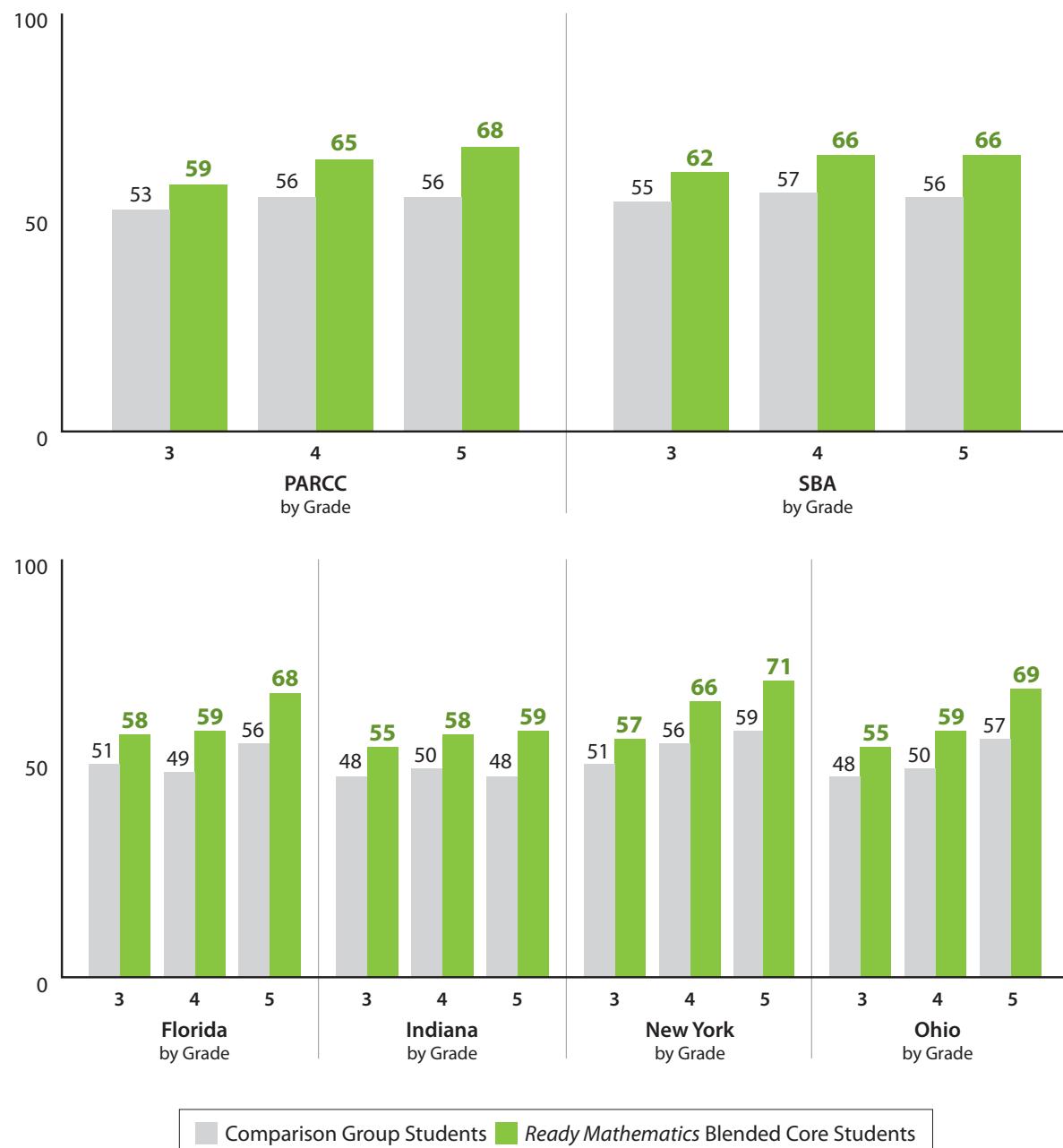
In order to make the effect sizes more educationally meaningful, the subject and grade-level effect sizes were translated into the number of weeks of instruction as an improvement index. The number of weeks of instruction represents the number of additional weeks of instruction that *i-Ready* students gained over the comparison group based on the magnitude of the difference between the *i-Ready* students’ score gains and the comparison group students’ score gains. For example, an effect size of .18 for Grade 3 students in reading translates into 10 weeks of additional instruction growth that a student using *i-Ready* would gain over a comparison group student. Note that the average amount of growth per grade and subject varies, so the same effect size can translate into a different number of weeks of instruction based on the subject and grade level. In addition, this translation is not meant to be precise, but it can provide a general idea of the difference.

The results of this study suggest *i-Ready Personalized Instruction* has a positive impact on historically marginalized student groups when used with fidelity.

# Interpreting Results in the Context of State Test Scores

Although the research was not conducted using state test scores, it can be helpful to interpret the results of this study in the context of state summative assessments. The impact of using the *Ready Mathematics Blended Core Curriculum* is roughly equivalent to students scoring 6–12 percentile ranks higher than they would have otherwise scored on state summative assessments such as the Partnership for Assessment of Readiness for College and Careers (PARCC), Smarter Balanced Assessment (SBA), and the state tests from Florida, Indiana, New York, and Ohio.

**Graph 2. Approximated Percentile Rank Differences on Typical State Tests**



# Summary

HumRRO's findings suggest participation in the *Ready Mathematics* Blended Core Curriculum resulted in higher student-level achievement in mathematics, as measured by the *i-Ready Diagnostic*, compared to a comparison group of students using only the *i-Ready Diagnostic*. For students with comparable starting points, the mean mathematics achievement for the *Ready Mathematics* Blended Core Curriculum group was statistically significantly higher in all Grades K–5. Moreover, the effect sizes showed additional support that students in *Ready Mathematics* schools benefited from their school's adoption and implementation of the *Ready Mathematics* Blended Core Curriculum and *i-Ready Personalized Instruction*. Not only do the results from this study yield ESSA Level 2 evidence for the *Ready Mathematics* Blended Core Curriculum, but they also meet the requirements for the WWC for quasi-experimental designs.

# References

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Curriculum Associates is a rapidly growing education company committed to making classrooms better places for teachers and students. We believe that all children have the chance to succeed, and our research-based, award-winning products, including *i-Ready*, *i-Ready Classroom Mathematics*, BRIGANCE®, and other programs, provide teachers and administrators with flexible resources that deliver meaningful assessments and data-driven, differentiated instruction for children.

To learn more, please visit [CurriculumAssociates.com](https://CurriculumAssociates.com).



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